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EXAMINER	
FULLER, ERIC B	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/715,935	BI ET AL.	
	Examiner	Art Unit	
	Eric B Fuller	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 September 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-54 and 56-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-54 and 56-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18-29, 33-42, 44, 46-51, 56-57, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Akedo et al. teaches a film forming apparatus that directs a particle stream, which is made up of nanoparticles, towards a substrate and moves the substrate relative to the particle stream in order to coat the substrate (column 3, line 10-12). The input of this apparatus is a continuous stream of particles with a size ranging between 10 nanometers to 5 microns (column 2, lines 41-60). Akedo fails to explicitly teach how the particles are produced. However, Bi teaches an apparatus that reacts a reactant stream by directing a focused radiation beam at the reactant stream to produce a product stream comprising particles downstream from the radiation beam, wherein the reaction is driven by energy from the radiation beam (summary). The product stream of this apparatus is a continuous stream of nanoparticles. The benefit over the prior art in using this method in order to produce nanosized particles is the efficient use of resources at high production capacity without sacrificing particle quality (column 2, lines

16-24). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have the Bi apparatus provide the nanoparticle input of the Akedo apparatus (reference 23, figures 6 and 9). The references collectively fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Claim 30, 43, 45, 52, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lehman (US 6,097,144) in view of Akedo et al. (US 6,280,802 B1), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134) in further view of Kambe et al. (WO 99/23189).

Lehman teaches a process of producing a glass coating that involves applying frit to a cold or heated substrate. The process is performed by mixing the frit, having a

200-325 mesh size, with a carrier solvent and the spraying the coating to the surface (column 5, lines 50-67). If the substrate is cold, a series of heating and cooling steps are performed in order to melt, fuse, and anneal the glass coating (column 6, lines 1-20). Lehman fails to use the method of applicant's claim 18 to apply the glass coating. However, Bi teaches that nanoparticles exhibit exploitable chemical and mechanical properties that are different from larger sized particles (background), and that the taught apparatus is advantageous to use in order to produce these nanoparticles due to its efficient use of resources (column 2, lines 17-25). An additional obvious benefit of having the particles be of a smaller size would be the ability to form thinner, or more uniform, films of glass. The Akedo, Bi, and Rao references can be combined as taught previously in order to produce coatings by nanoparticles, and therefore it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Akedo, Bi, and Rao in order to apply the glass coating of the Lehman process in order to reap the benefits of a thinner, or more uniform, coating. Additionally, the combined process would be more efficient as a carrier solvent would no longer be required. The Kambe reference is used in order to establish that the combined Bi and Akedo apparatus is capable of producing glass particles. Kambe teaches a similar apparatus as Bi, as nanoparticles are produced by laser irradiation. The differences between Kambe and Bi are in the process that the particles perform after they are produced, and not in how they are produced. The nanoparticles produced in the Kambe apparatus is silica (abstract), which can be used for producing glass. It would have been obvious from the Kambe reference that the apparatus taught by Bi

would also be able to produce silica nanoparticles. Furthermore, it would have been obvious that the combined Akedo and Bi apparatus is able to produce silica coatings as well, as column 5, first paragraph of the Akedo reference teaches that the apparatus taught is capable of producing oxide films.

In performing this process, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use a silicon precursor in order to achieve silicon oxide as the product stream.

Claims 18-29, 33-52, and 56-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Kambe et al. (WO 99/23189) and Rao et al. (US 5,874,134).

Akedo teaches the limitations as shown above, specifically to deposit nanoparticles of oxides onto a substrate, but fails to explicitly teach using the process of Kambe as the input of the method. However, Kambe teaches the production of silicon oxide particles by a process shown above. To use the process of Kambe to provide the input of Akedo would have been obvious as the process of Kambe provide a high level of purity (page 1, lines 30-35) and efficiency (page 2, lines 1-5). The combined references fail to teach performing the process in-line.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus.

Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Kambe in an in-line fashion (having the product stream of Kambe be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits a high level of purity and efficiency. The method that results meets the applicant's claims.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lehman (US 6,097,144) in view of Akedo et al. (US 6,280,802 B1), Kambe et al. (WO 99/23189), and Rao et al. (US 5,874,134).

Lehman teaches a process of producing a glass coating that involves applying frit to a cold or heated substrate. The process is performed by mixing the frit, having a 200-325 mesh size, with a carrier solvent and the spraying the coating to the surface (column 5, lines 50-67). If the substrate is cold, a series of heating and cooling steps are performed in order to melt, fuse, and anneal the glass coating (column 6, lines 1-20). Lehman fails to use the method of applicant's claim 18 to apply the glass coating. However, the Akedo, Kambe, and Rao references can be combined as taught previously in order to produce coatings by nanoparticles. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Akedo, Kambe, and Rao in order to apply the glass coating of the Lehman process in order to reap the benefits of a thinner, or more uniform, coating that

is possible with smaller diameter particles. Additionally, the combined process would be more efficient as a carrier solvent would no longer be required.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 6,074,888) in view of Lehman (US 6,097,144), and further in view of Akedo et al. (US 6,280,802 B1), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134), in view of Kambe et al. (WO 99/23189).

Tran teaches that in order to produce an optical component, it is required to produce an optical component layer (abstract, summary), which is typically glass. Then photolithography is used to fabricate the optical component (column 3, line 59). Tran fails to teach applying the coating by the method taught by applicant's claim 18. However, it has been shown that the Lehman, Akedo, Bi, Rao, and Kambe references can all be combined to teach a method of producing a glass coating that has the advantages of being more uniform, is capable of being thinner, and does not require a solvent. To use this method of forming a glass coating when producing the optical layer taught in the Tran reference would have been obvious at the time the invention was made to a person having ordinary skill in the art in order to reap the benefits of a thinner, more uniform, coatings without the need for a solvent.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (US 6,074,888) in view of Lehman (US 6,097,144), and further in view

of Akedo et al. (US 6,280,802 B1), Kambe et al. (WO 99/23189), and Rao et al. (US 5,874,134).

Tran teaches that in order to produce an optical component, it is required to produce an optical component layer (abstract, summary), which is typically glass. Then photolithography is used to fabricate the optical component (column 3, line 59). Tran fails to teach applying the coating by the method taught by applicant's claim 18. However, it has been shown that the Lehman, Akedo, Kambe, and Rao references can all be combined to teach a method of producing a glass coating that has the advantages of being more uniform, is capable of being thinner, and does not require a solvent. To use this method of forming a glass coating when producing the optical layer taught in the Tran reference would have been obvious at the time the invention was made to a person having ordinary skill in the art in order to reap the benefits of a thinner, more uniform, coatings without the need for a solvent.

Claims 18-29, 33-42, 47-51, 53, 54, 56, 57, and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Börner et al. (US 6,032,871) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Börner teaches a process of spraying two different materials to a substrate by applying differing charges to each particle stream (figure 3). Börner is silent to how these particle streams are produced. However, Bi teaches that nanoparticles exhibit exploitable chemical and mechanical properties that are different from larger sized particles, such as increased smoothness and thinner coatings (background). The

apparatus taught by Bi is advantageous to use in order to produce these nanoparticles due to its efficient use of resources (column 2, lines 17-25). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the apparatus of Bi to produce the particle streams of Börner. By doing so, one would reap the benefits of having an efficient way of producing nano-sized particles such that a smoother and/or thinner coating is achieved. The references fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Börner in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Börner reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Claims 42-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Börner et al. (US 6,032,871) in view of Akedo et al (US 6,280,802), Bi et al. (US 5,958,348), and Rao et al. (US 5,874,134).

Börner teaches the desire to have powder coatings of two different materials applied to the same substrate by means of two differently charged particle streams. Akedo, Bi, and Rao, combined, teach a materially efficient method of producing charged particle streams that have the benefit of being nano-sized, which results in thinner and/or smoother coatings, as explained above. Therefore, it would have been obvious to use the method and apparatus of Akedo, Bi, and Rao to provide the particle streams of Börner. By doing so, one would reap the benefits of an efficient way to produce smoother and/or thinner coatings. By figure 3 of Börner, one in the art would be motivated, when combing the references, to have a separate "Akedo and Bi" apparatus provide each stream. This is because the streams of figure 3 are coming from separate sources.

Claims 18-20, 23, 25, 27-29, 39-41, 56, and 58-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao et al. (US 5,874,134) in view of Bernecki et al. (US 5,744,777).

Rao teaches producing particles of silicon (column 6, lines 4-5) by reacting a reaction stream with a high-energy laser (column 4, lines 25-30). The particles are deposited on a substreate in-line by a hypersonic plasma particle deposition process (column 5, lines 55-60). The deposition rates are within the applicant's ranges (column 7, lines 55-65). The reference fails to teach supplying motion between the substrate and the product stream. However, Bernecki teaches that larger substrates may be coated by providing motion between the plasma spray and the substrate (column 8,

lines 25-35). Therefore, it would have been obvious to provide motion between the product stream of Rao and the substrate. By doing so, larger substrates may be coated.

As to methods of providing motion, to use a movable stage to move the substrate or means to move the apparatus of Rao would be obvious variations of each other, as both act to achieve the same relative motion.

Response to Arguments

Applicant argues that the amendments to claims 55-58, 60 and 61 overcomes the 35 U.S.C. 102(b) rejection based on Kambe. Examiner agrees and has withdrawn the rejection accordingly. It is noted that these claims are still rejected by different grounds.

Applicant argues the combination of Akedo in view of Bi and Rao. With respect to claims 18-29 and 44, the applicant argues that Rao teaches away from the claimed invention by having the laser energy be directed along the flow of the reactant stream. This is found unconvincing. Claim 18, the independent claim, does not have a limitation that excludes the reaction beam from being directed along the flow of the stream nor does it contain a limitation that limits the radiation beam being at an angle to the flow, as the applicant suggests. Applicant argues that because it is claimed that the product particles are located downstream from the radiation beam, this implies that the radiation beam is at an angle to the reactant stream. This is not persuasive. It certainly is possible to have a product stream downstream from a radiation beam that is directed

along the flow of the reactant stream. For example, by having the product stream angled from the reactant stream, which the claims are open to. Therefore, it is the position of the examiner that the claim 18 does not imply that the radiation beam must be at an angle to the reaction beam. The dependent claims 19-29 and 44 also do not contain this limitation.

Furthermore, Rao teaches that the radiation beam is directed at the reactant stream. The product stream that exists in the coating chamber (20) is expanded and the expanded product particles read being downstream from the radiation beam. Therefore, Rao does not teach away from the claimed invention since it reads on the limitations that the applicant points to as being implication of a limitation that is not present.

Additionally, and also with respect to claims 33-38 and 46-51, applicant argues against the reference individually. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is noted that Rao is relied on as a tertiary reference that teaches the obviousness and motivation of performing the process of Akedo in view of Bi in an in-line fashion. To use additional modifications from Rao, such as using the radiation beam at a different orientation than that taught by Bi as the applicant suggests, would require further obviousness and motivation for those modifications, in which the examiner does not find any.

The examiner believes that one of ordinary skill in the art, having an engineering degree, would have the knowledge, intuition, and ability to use the method taught by Bi to produce the nanoparticles needed for the process taught by Akedo, with the motivation being the efficiency of Bi. From this, one of ordinary skill in the art would be presented with the notion of performing the process by batch or continuous, a common notion that engineers face. By collecting the nanoparticles of Bi and transferring them to the apparatus of Akedo, the process would be batch. By realizing that Bi has a moving stream at the outlet and Akedo requires a moving stream for the inlet, a person with the ingenuity of an engineer would at least recognize that instead of stopping the stream in Bi and restarting it in Akedo, that the process could be performed continuously. It is within the level of ordinary skill to operate a process continuously. *In re Dilnot* 138 USPQ 248 (CCPA); *In re Korpi* 73 USPQ 229 (CCPA 1947); *In re Lincoln* 53 USPQ 40 CCPA 1963). Regardless, the examiner has supplied Rao as teaching the motivation for performing the process taught by Akedo and Bi in an in-line fashion. Even though the reference has been taken into account in it's entirety, the examiner does not make use of other features of the Rao reference to be incorporated in the process taught by Akedo in view of Bi, as further obviousness and motivation for these other features do not exist above that all ready supplied by Akedo in view of Bi.

As to claims 39-41, applicant argues that the substrate size of the claims is not disclosed in the references, as the references are mostly silent to substrate size. This argument is not found convincing. One of ordinary skill in the art, being that of an engineer, would have the ability and ingenuity to scale the process such that substrates

of various sizes could be coated by the process. Additionally, since the substrate is moved and there are no time constraints of the process, the size of the substrate is not limited by the process beyond that of fitting it in the coating chamber of Akedo, which is also not constrained in size. Sizes within the applicant's range of greater than 5 cm would be obvious, absence evidence of criticality.

Applicant argues that the limitations of claim 42 are not taught. This argument is not found convincing as the limitations of claim 42 are read upon by a mere duplication of parts, as discussed in previous Office Actions.

As to claims 55-57 and 59-61 applicant argues the deposition rate. This is not found convincing. Bi is capable of producing particles at such a rate. To perform the process in line with Akedo would result in the claimed deposition rate. Additionally, the use different deposition rates by scaling the process would have obvious to one with the ingenuity of an engineer, absence evidence of criticality.

All other arguments, with respect to the different grounds of rejection, mirror the same arguments above. These arguments are found unconvincing for the same reasons indicated above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (703) 308-6544. The examiner can normally be reached on Mondays through Thursdays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck, can be reached at (703) 308-2333. The fax phone number for the organization where this application or proceeding is assigned is 703 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

EBF

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